FIRE INSURANCE—RATES AND SCHEDULE RATING

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Before discussing the question of schedules and schedule rating, it is necessary to have a clear conception of what in the insurance nomenclature is understood by the term "rate." Briefly, a rate is the amount charged for insuring $100 of property for one year. The premium is the amount paid for insuring the property, and the sum insured is known as the amount of the policy.

$$\text{Therefore } \frac{\text{amount of policy} \times \text{rate}}{100} = \text{premium.}$$

For commercial reasons insurance is often desired for a less or greater term than one year. In the former case it is customary to charge the short rate of the annual rate, and in the latter case a multiple of the annual rate. For example, the annual rate being 1 per cent. for one month, two-tenths of the annual rate is charged; for two months, three-tenths, etc. For terms in excess of one year it is customary to charge 75 per cent. of the annual rate for each additional year. So that a two-year policy, the annual rate being 1 per cent., is written at a rate of 1.75; a three-year policy at 2.50; a four-year policy at 3.25, and a five-year policy at 4.

It will be interesting to note that in Philadelphia, the home of the first fire insurance company organized in this country, a system of perpetual insurance is still in use. The perpetual rate of a risk is the rate per cent. which, multiplied by the amount of the policy, will produce a premium, the interest from which produces a sum sufficient to pay the annual premium. It follows that so long as the deposit remains with the insuring company, the insurance will continue in force, inasmuch as the interest on the deposit pays the annual premium. To convert an annual rate into a perpetual rate, the

annual rate is multiplied by a constant figure, based of necessity on the money interest rate obtainable. At the present time the perpetual rate is computed to be twelve times the annual rate.

Rates should be sufficient to produce an income large enough to provide for the payment of losses, plus the necessary expenses of the insuring company, plus a reasonable profit for the stockholders. The classification of losses is, therefore, necessary for a proper consideration of the rate. The experience derived from the classification of losses of one company cannot be taken as satisfactory, and combined classification is the logical result. In this, the combining of experiences in loss classification, we have the first step toward the organization of rating bureaus.

It is impossible in the brief space alloted to me to give a complete resumé of the history of rate making. I will, therefore, confine myself to the history of the development of the association I am connected with, the Philadelphia Fire Underwriters' Association, believing that in the development of that organization all of the various advancements in scientific rate making can be clearly traced. The "Philadelphia Board of Fire Underwriters" was organized in April, 1852. Its object was to classify and rate temporary (not perpetual) risks. Companies issuing perpetual policies did not assist in the organization. Rates were made and promulgated on the basis of the difference in fire hazard, as determined by the general experience of the companies, which were members of the organization. In time the list of "Classes of Hazard and Rates of Premium for Insurance Against Loss or Damage by Fire in the City and County of Philadelphia" was promulgated. While this list could not have been expected to be a marvel in conception and results, it was the beginning of rate making on a sound fundamental principle, which has been maintained up to the present day. Briefly, the rate of the building was based on construction, material of construction, use of building or occupancy, location, height and depth. The rate of contents was graded as to whether the "goods" were equal to the building; as to the building hazard with the combustible hazard of goods added; or as affecting the building risk. It is interesting here to note that nearly fifty years later these three grades under the terms "susceptibility," "ignitibility" and "combustibility" were given the same consideration by the framers of the universal mercantile schedule, which will be discussed later on. Stores and warehouse

buildings were graded by classes, a first-class building being one constructed of brick or stone or iron with a tile, slate or metal roof, cornice of brick, stone or metal, fire walls extending above the roof, and iron shutters front and rear.

The second-class building deviated from this in one particular, the third-class building in more than one particular, and the fourth-class building being of frame construction. We also find that, in addition to the basis rate for the class, additional charges were made for height, depth, skylights and communications. Location, charges for inaccessibility to fire apparatus, and congestion of values, as well as exposure to hazardous risks, were also considered. All these deficiencies are found worthy of consideration in the most advanced rating schedule of to-day. Congested or conflagration districts were also given consideration and penalized by flat advances. Merchandise or "goods" were then classified as not hazardous, hazardous and extra hazardous, and a sum named for each class, which, added to the building rate, gave the rate for insurance of the merchandise, so that here also the principle of discrimination between the susceptibility to damage between building and contents was clearly indicated. Non-hazardous, hazardous and extra hazardous goods were subdivided into about 150 classes, with rates varying from ten to forty cents to be added to the building rate. Specially hazardous risks comprising the various manufactories were rated by classes, with distinction as to whether steam, water or hand power was used, and also as to whether the building containing the risk be constructed of brick or stone or wood; the rate charges to be added to the building rate (which we will consider later as "occupancy charges"), varied from fifty cents to six dollars.

In 1857 the Philadelphia Board of Fire Underwriters published a booklet containing practically unchanged the charges and classifications above cited, together with a list of minimum premiums in three columns, the first column to be charged in addition to the building rate, the second column being the full premium in a brick or stone building, and the third column being the full premium in wooden buildings, it being stipulated that merchandize in wooden buildings could be insured at the building rate, and that certain articles with a star prefix did not affect the rate of the building or of other articles in the building. An examination of these three columns, shows that the second, where the rate applies to buildings and

contents, consists of such risks as are at present classed under the general term "special hazard." A special charge of ten cents for "camphene or burning fluid," or any similar inflammable liquid, "if used for lighting or kept for sale by the assured," is the only deficiency charge other than those enumerated. Ten years later the booklet was republished, containing, in addition to the charges and rates in the booklet of 1857, rates on specific risks by name. The table of minimum premiums contained more items, and provision was made for insurance for more than one year and for short periods.

In 1872 a tariff of rates of premiums for insurance, adopted by the "Association of Fire Underwriters of Philadelphia," was published. The tariff showed a decided advance in the methods of rating. Fire doors to communications are recognized, and charges for their absence provided; charges for additional tenants are fixed, and the rates for longer terms than one year are placed at two and one-half rates for three years, four rates for five years and five rates for seven years. The list of specially rated risks is largely increased, and the list of minimum rates is made to apply to third-class buildings, with a deduction for first- and second-class buildings of ten and five cents, respectively. A reduction in the rate of the building from the contents rate is also provided. The rate book published in 1876 shows a still further advance in discriminating charges and a large addition to the list of specially rated risks. It is also noted that "improvements" will affect the rate, and that "no reduction in the rate shall be made for promised improvements."

The present Philadelphia Fire Underwriters' Association was organized in November, 1883. The objects of the association are set forth in the constitution and by-laws as follows:

> The object of this association shall be the reduction of the fire waste of the city of Philadelphia, the establishment of just and fair rates, limited and perpetual, whereby the cost of fire insurance may be equitably distributed among all classes of manufacturers, merchants, private householders and others. For these purposes this association will establish a system of schedule and minimum ratings, giving the best risks the lowest rates, and adding specific charges for all deficiencies from required standards, making reductions from such rates when the deficiencies charged for are eliminated, and also provides rules and plans for regulating the practices of the business of fire underwriting in the city of Philadelphia.

Continuing on the methods outlined, rates on special risks were promulgated under the direction of rating committees for some time. The necessity of better and more complete methods of rating was now becoming more and more apparent, and the formulation of schedules of different classes of manufacturing risks was the result. The schedule at first gave consideration to the main physical hazards —such as the question of picker in or outside of the main mill, location of boiler and disposal of shavings in woodworking risks, location and arrangement of drying, etc. Subsequently, the construction and arrangement of the building in regard to the hazard of the occupancy and the protectional and preventive features were studied, until at length a rating schedule, such as is at present in use throughout the country in one form or other, was adopted.

A schedule for rating a risk of a certain class consists of a description of a standard risk of such class, giving due consideration to the construction, protection and physical conditions and hazards of the class, and of a table of charges for deficiencies or deviations from the standard. A standard woodworking risk, for instance, would be rated at 4 per cent., this figure being called the "basis rate." To this basis rate deficiency charges are added, as per the schedule, for deviation from the standard, the total sum resulting being the rate charged for insuring the specific risk. As an example, the schedule for rating a saw and planing mill provides that a standard mill shall be constructed of brick or stone, not over four stories or three stories and basement in height; not over 7,000 square feet in area; the roof of metal, slate or approved composition; cornice of brick, stone or metal; wall of the thickness required by the building laws; floors of three-inch plank, tongued and grooved, or splined with one-and-a-quarter-inch flooring boards on top, and no openings in the floor; ceiling not boarded or plastered and without concealed spaces; stairways and elevators in a separate brick or stone stairway, or elevator house with standard fire doors at each landing; driving belt in a separate belt race, with no belt holes in the floors; heating by steam pipes suspended on metal clear of all woodwork; lighting by gas or incandescent light; boilers in a separate brick or stone boiler house; communications to the main mill, if any, to be protected by standard fire doors; stack of brick; shavings to be taken up from various machines as soon as made, by suction fan, and conveyed through metal conduit pipes to a fireproof brick shav-

ing house securely cut off from the boiler house or main mill by standard fire doors; shaving house to be of ample size to store all surplus shavings made on the premises, and to be provided with a cyclone dust collector; steam jet to be placed in the shaving vault, with valve in the boiler room; drying to be done by steam in a brick dry house securely cut off from other buildings by standard fire doors; painting, oiling, varnishing and upholstering not to be done in the building; benzine not to be used in the building; watchman to be used at night, with an approved clock, and to make hourly rounds, nights, Sundays and holidays; fire protection to consist of approved standpipe, with hydrant and hose on every floor as required; standpipe to be supplied by elevated tank, steam pump or city water if pressure is sufficient; buckets and casks to number at least one cask and six buckets for each 2,500 square feet floor area; single occupancy required.

A mill conforming in all respects to the above would be considered a standard saw and planing mill, and such property would be insured at the basis rate, with a further reduction for automatic sprinklers. If on surveying a specific mill it is found that conditions deviating from this standard exist, deviation charges would be made as provided in the schedule, item for item, and the sum of these charges, together with the basis rate, is the rate at which the specific mill can be insured. The owner of the mill, being furnished with a list of the deviation charges, can, if he is so disposed, make the necessary changes, and very often at an expense not at all excessive; when results are considered he can very materially reduce his rate. In a like manner schedules are prepared for the many varying classes of manufacturing risks, necessitating in every case a careful study of the process of manufacture, so that the physical hazard of each process can be studied and the proper safeguards suggested.

While primarily the schedule must be considered the means of measuring a risk and of producing a rate commensurable with the hazard of the specific risk, the value of the schedule and of schedule rating, as a means of improving risks from a fire prevention viewpoint, and thereby diminishing the possibility of loss of life and property by fire, cannot be overestimated. The study of fire prevention has in the last few years developed greatly, due largely to the general adoption of the principle of schedule rating by the various rating organizations throughout the country. A large number

of examples of the value of schedule rating resulting in improvement of property can be cited, but I will confine myself to citing a few examples, where a specific class of factories, which at one time were a constant source of loss to the insuring companies even at high rates, was made profitable at a low rate by reason of judicious schedule rating. For years the shoe factories in the New England States, by reason of frequent fires, caused serious loss to the insuring companies. Flat advances of rates had no effect. At last a committee of the rating organizations having jurisdiction was given charge of the matter. This committee very wisely took up the question directly with the manufacturers, and by studying with them the various hazards of their business, as well as the various defects in construction of the buildings, in methods of management and in fire protection, by a rating of the various risks by schedule, brought out the deviation from the standard previously prepared.

The result was that in a short time the various properties were so changed that they are now profitable risks to insure at a fraction of their previous rate. Similar action, having like results, was had in the case of the rubber factories, a class of hazardous risks which for years proved unprofitable to the insuring companies, and which after judicious handling by a special committee and by cooperation with the manufacturers were so much improved that as a class they have become profitable risks to carry at a much lower rate. The above examples were cited at length in an address delivered by Mr. U. C. Crosby before the fourth annual convention of the National Fire Protection Association. Mr. Crosby, speaking as an underwriter, said: "Profit is made in eliminating the causes of fires, increasing facilities for extinguishing the same, and not in advancing rates." This is an axiom which has been accepted by practically all rating organizations throughout the United States.

To a student of schedule rating, who in pursuance of his studies examines schedules for rating a certain class of risks prepared in different sections of this country, one thing will be very apparent. While the standard of the class of risk will be practically the same, a great diversity in the value placed on various deficiencies will be noted. It stands to reason that the presence of a picker in the main mill, or of the boiler in the saw mill, should not be considered a greater hazard in one part of this country than in another. Nevertheless, we may find that the charges for these deviations may be

twice as much in one location as in another. This apparent distinction is difficult to explain. I am rather of the opinion, however, that the reason of the different charges is that in each district the framer of the schedule endeavored to bring out results not varying from the condition of rates existing prior to the application of the schedule. Rates vary in different sections of the country and in different cities, due to the general loss ratio of the locality. That this should be so will be apparent when it is remembered that the rate should be sufficient to produce an income to take care of losses and expenses, and provide for a reasonable dividend for the stockholders.

Having discussed the general question of rate schedules and schedule rating, it is now my intention to take up what has been well termed the "universal mercantile schedule." The history of the development of the "universal mercantile schedule" is interesting, and marks an epoch in the development of the science of schedule rating. Recognizing the desirability of a uniform system of rating mercantile risks in different sections of the country on a like basis, the committee to whom the question of framing such a schedule was referred selected co-operating committees representing underwriters' associations engaged in rate making. In addition to the co-operation of these committees, the parent committee also enlisted the help and co-operation of underwriters who were known to have given special attention to the question of schedule rating. To these copies of the schedule were sent, with the request to criticise the work of the committee freely. The work of the committee continued for a period of several years. In the history and analysis of the "universal mercantile schedule," the chairman of the committee, Mr. F. C. Moore, when submitting the final report of the committee, said:

> Schedule rating is a specific, accurate measure from the viewpoint of advantage or disadvantage, by a scale of insurance rates or prices, for every feature of a building and its contents, of construction, occupancy, fire resisting or extinguishing provisions, and also of its environment or surroundings, involving in the latter consideration such features as the liability of the city in which the building is located to conflagrations; the width and grade of its streets; its previous fire records; its police and fire departments, and, in fact, every consideration which an ideal underwriter supposedly possessed of the knowledge and experience combined of all engaged in the business would take into account in fixing a rate.

The scope and intent of the universal mercantile schedule is here laid down: "The rate of a standard building in a standard city,

located anywhere, should be the same." Briefly, the universal mercantile schedule considers the following points: (1) A standard city is described. It involves level and wide streets, gravity water works, adequate pipe service and all other features of fire department, police supervision, building laws, and laws and ordinances for handling explosives and chemicals. (2) A standard building is described, said building being a model of construction and embodying all modern safe construction and protection features. (3) A basis rate or key rate for such a building, which is arbitrarily fixed at twenty-five cents. To this are added certain charges for deviation of the city from the standard city as to water works, inaccessible or narrow streets, deficient fire apparatus and fire department, ineffective building laws, etc. The result—the key rate of the city is then used to determine the rate of any building in the city by adding in turn to the key rate the deficiency charges for constructional deviation from the standard.

After deducting from the result thus obtained the various allowances for superior construction and protection, or for other features tending to reduce the possibility of fire occurring, or to prevent its spreading, the result is the unoccupied building standing alone; that is to say, not exposed to any other building. Charges for exposure having been added in accordance with the hazard, the final result is the unoccupied building, exposed. To obtain the rate of the occupied building a sum representing the combustibility of the contents or manufacturing hazard is added. We now have the rate of the occupied exposed building. For the rate of the contents we add to this rate a sum representing the ignitibility and susceptibility of the contents. Charges for faults in management or housekeeping, added to the above rates, complete the final rate of the unoccupied building and contents.

The magnitude of the committee's work is apparent when it is considered that there are some 2,000 items in the occupancy table and some 2,500 in the table of susceptibilities. While it may be true that the charges for occupancy and susceptibility are in a measure arbitrary, the combined loss experience of a large number of companies was studied in their preparation, and the result can be accepted as approximately correct. In order that the schedule be not too long, instead of considering every recognized point of excellency in construction, protection and condition, percentage deduc-

tions for conditions better than those provided in the schedule were arranged so that the careful student of the schedule would be able to give consideration to the very best conditions known and recognized. The Universal Mercantile Schedule, either in its entirety, or modified to meet local conditions, is now in use in a very large part of the United States, and has demonstrated its great value as an educational factor, conclusively. In his able treatise entitled "Fire Rating as a Science," Mr. A. F. Dean discusses the relation of the schedule to classification, and points out the value of combined classification for correct schedule rating methods, in a clear and concise manner. While Mr. Dean contends that the Universal Mercantile Schedule has not solved the problem of correct fire rates, those familiar with the application of this schedule are satisfied that it is a great step toward the desired end.

The Universal Mercantile Schedule, and in fact all schedules, would produce erroneous results if the percentage of insurance to value of insured property were not considered. As an example, a property valued at $10,000, rated at 1 per cent., would pay $100 premium if fully insured, and only $50 premium if insured for half its value. In case of a fire destroying 50 per cent. of the value in the former case, the insuring companies would pay $5,000, or 50 per cent., of the sum insured. In the latter case, the insuring companies would pay $5,000, or a total loss under their policies. As a basis of equitable rating, a percentage of insurance to value must be agreed upon. This percentage has been fixed at 80 per cent. A clause on the policy noting this fact is called the "coinsurance" or "average clause." One of the provisions of the clause is that the assured in event of a loss becomes coinsurer for the deficiency between the amount insured and 80 per cent. of the value of the property, or, in other words, stands his share of the loss with the insuring companies in proportion as the amount insured bears to 80 per cent. of the value of the property. The clause in question in use in this city reads as follows:

Reduced Rate Average Clause.—In consideration of the reduced rate at which this policy is written, it is expressly stipulated and made a condition of this contract that this company shall be liable for no greater proportion of any loss than the amount hereby insured bears to — per cent. of the actual cash value of the property described herein at the time when such loss shall happen, nor for more than the proportion which this policy bears

to the total insurance thereon; provided, however, that if the aggregate claim for any loss shall not exceed 5 per cent. of such actual cash value, no special inventory or appraisement of the undamaged property shall be required.

If this policy be divided into two or more items, the foregoing conditions shall apply to each item separately; and if two or more buildings or their contents be included in a single item, the application of the provision as to special inventory or appraisement shall be limited to each building and its contents.

As an example of the application of this clause, let us assume that the value of a property is $10,000 and the sum insured is $8,000, or 80 per cent. of the value. In event of a loss the insuring companies pay the entire loss not exceeding the amount of the policy; if there is but $5,000 insurance, the value being $10,000, in event of a loss of $5,000 the insuring companies would pay five-eighths of the loss, or $3,125, and the assured would pay three-eighths of the loss, $1,875. The coinsurance or average clause is inoperative when the insurance carried is equal to or exceeds the sum required to be insured, or when the loss equals or exceeds the per cent. of value required to be carried under the clause, or when the property is entirely destroyed. As stated, the rate obtained by application of the schedule is based on the fact that 80 per cent. of the value of the property is insured. Should the owner elect to insure less than 80 per cent. of the value he can do so at an advance in the rate, or if he elects to insure for the full value of his property he can do so at a reduced rate.

For the proper application of schedules to different risks, and for the promulgation of rates to the various insurance companies, rating organizations or boards are necessary. While primarily these boards were organized for rating purposes only their scope has been so enlarged that they have become technical bureaus where architects and builders or owners of properties can obtain all information as to improved construction and protection of their property against loss by fire. The examination and criticism of architects' plans and specifications, the preparation of plans for sprinkler installation and other fire protection, and the suggesting of safe electric installations, are but a few of the duties such boards are called upon to perform. The study of municipal laws and ordinances controlling the construction of buildings, the safekeeping and using of chemical explosives and combustibles, and the suggesting of better-

ments in the laws and ordinances must also be considered among the duties of the rating board. The study of the conflagration hazard of the city and the safeguarding against such conflagration hazard are of the greatest importance, and must of necessity be taken up by the rating board.

Experience has taught, and facts confirm, that improvements in fire hazard of a building, or of the city, can be obtained through schedule charges, for the defects, in the rate of insurance when the individual risk is under consideration, and by general advances to all rates when the city is under consideration. A slip for inefficient fire defence or water supply, and a slip for conflagration hazards attached to policies (each slip stating that for deficiency in the one and for hazard in the other a fixed charge over and above the rate is added to the premium) bring the defects so forcibly to the attention of the property owners that their co-operation is at once enlisted to bring about the desired result.

In discussing the varying charges for the same defects in schedules in use in different sections of the country, and suggesting the reasons for such variation, I did not call attention to the difficulty encountered when schedule rating was being developed, due to the great diversity in the requirement for construction and protectional features. The necessity of uniformity in requirements soon became apparent. To that end, some nine years ago, representatives of various rating boards were invited to a meeting in New York City to discuss rules for installation of automatic sprinklers, and for the formulation of uniform rules applicable to all parts of the country. This meeting resulted in the organization of the "National Fire Protection Association." This association of rating boards, meeting annually, formulates standards and requirements for various constructional and protectional features. These, being promulgated by the National Board of Fire Underwriters, became the recognized uniform standards for use throughout the country. Expressly disclaiming any desire to even consider the question of rates, the work of the National Fire Protection Association has taken up through special committees the question of preparing standards for various classes of manufacturing risks, so that uniformity in standards of classes may result. The study of varying processes of manufacture, and changing hazards of the same, and especially the safeguarding of hazards from heating and lighting, has been intrusted to

a committee of consulting engineers. This committee gives special attention to the formulation of rules for safe installation of apparatus for lighting and heating, and for the construction and control of such apparatus. For the furtherance of the work above outlined the National Board of Fire Underwriters maintains an underwriters' laboratory, where tests of materials and devices designed for better construction and protection of property are made. The laboratory also examines and tests apparatus and devices, which may be considered as increasing the fire hazard, listing such as may be permitted under restrictions formulated by the committee.

In preparing this paper on rate making it was my desire to call attention in a general way to the great amount of detail work and investigation necessary to produce even approximately correct ratings. Also, to give a general idea of the methods of preparing schedules, and of the technical work carried on to that end. I have endeavored to convey the thought that schedule rating as at present practiced by the various rating organizations is a public benefit, tending toward the reduction of the annual fire waste and to the prevention of loss of life and property by fire. The value and necessity of combinations of insurance companies for the exchange of experience and for the enforcement of improvement in building construction, and in the safeguarding of hazards by means of schedule rating, should appeal to all.